Roll No.									

Dr. Shakuntala Misra National Rehabilitation University, Lucknow
Institute of Engineering and Technology
Department of Electronics and Communication Engineering
Sessional Examination-Ist (2023-24)

Course Name: -B.Tech (ECE) **Semester: - 3rd**
Subject Name: - Digital System Design **Paper Code: -TEC-302**
Time - 90 Minutes **Max Marks-20**

Instructions:

- The question paper consists of three sections namely A, B, and C. All sections are compulsory.
- Section A- Each question will carries **01** mark. All questions are compulsory.
- Section B- Answer any **5 out of 6** in the given questions. Each question will carries **2 marks.**
- Section C- Answer any **1 out of 2.** Each question will carries **5 marks.**

Section – A
Objective Questions

1. Answer all the following questions 5×1=05

I. Which of these sets of logic gates are known as universal gates?

(a) XOR, NAND, OR (b) OR, NOT, XOR
(c) NOR, NAND, XNOR (d) NOR, NAND

II. Which of the following options represent the correct reduction of $X\bar{Y}Z + \bar{X}\bar{Y}Z$

(a) 0 (b) $\bar{Y}Z$
(c) $X + \bar{Y}$ (d) $X\bar{Y}$

III. The Boolean function AB + AC is equivalent to .....

(a) $\bar{A}B\bar{C} + AB\bar{C} + \bar{A}BC$ (b) AB + BC + AC
(c) $ABC + \bar{A}BC + \bar{B}\bar{C}$ (d) $ABC + AB\bar{C} + A\bar{B}C$

IV. D flip flop can be made from a J-K flip flop by making
(a) J=K (b) J=K=1
(c) J=0, K=1 (d) J=$\overline{K}$

V. Race Around condition occur in .....
(a) Level Triggered R-S Flip Flop (b) Level Triggered J-K Flip Flop
(c) Edge Triggered R-S Flip Flop (d) Edge Triggered J-K Flip Flop

Section – B

Short Answer Type Questions

2. Answer any five of the following questions in maximum 50 words. 5×2=10

I. What is noise margin and propagation delay in digital circuit? Explain with diagram.

II. What is a demultiplexer? Obtain a 1:8 DMUX using two 1:4 DMUX.

III. Write short note on master slave J-K flip flop.

IV. Convert D flip flop into T flip flop.

V. What is a digital comparator circuit? Design 1-bit magnitude comparator circu

VI. Implement the following Boolean expression using 4:1 multiplexer.
F(A,B,C)= $\bar{A}B\bar{C} + AB' + A\bar{B}C + \bar{A}\bar{B}$

Section – C

(Descriptive Questions)

3. Answer *any one* question in maximum 150 words. 1×5=05

I. What is a flip flop? How many types of flip flop in digital system? W
Characteristics table and Excitation table of all flip flops.

II. What is FSM? Design a FSM by J-K flip flop whose count following state.
2-6-4-0-7-2-6-4-0-7-2.....

SEMESTER EXAMINATION DECEMBER-2023

Course Name: - B.Tech. (ECE) **Semester:- III**

Paper Name: - Digital System Design **Paper Code:- TEC 302**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न तीन अंक का है। सभी प्रश्न अनिवार्य हैं।
- खण्ड–ब में सात प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10** अंक का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which one of the following is not correct?

a) $\overline{P \oplus Q} = P \odot Q$

b) $\bar{P} \oplus Q = P \odot Q$

c) $\bar{P} \oplus Q = P \oplus Q$

d) $(P \oplus \bar{P}) \oplus Q = (P \odot \bar{P}) \odot \bar{Q}$

ii) T flip flop can be made from a J-K flip flop by making

a) J=K

b) J=K=T

c) J=K=1

d) J=$\bar{K}$

iii) Race condition occur in .....

a) Level Triggered S-R Flip Flop

b) Level Triggered J-K Flip Flop

c) Edge Triggered J-K Flip Flop

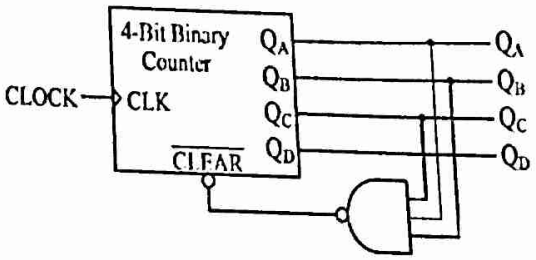
d) Edge Triggered D Flip flop

iv) The Three Domains of the Gajski-Kuhn Y-chart are:

a) Physical- Operational- Structural
b) Physical-Behavioural- Functional
c) Physical-Behavioural- Structural
d) Functional-Operational-Technical

v) A mod-n counter using a synchronous binary up-counter with synchronous clear input is shown in the figure where Q_A is MSB bit and Q_D is LSB bit. The value of n is

a) 13
b) 12
c) 7
d) 14



Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. 5x7=35
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Explain and write the step of VLSI design flow with diagram?

ii. What are combinational and sequential circuits, and how do they differ? Design a combinational circuit that adds one to a 4 bit binary number $A_3A_2A_1A_0$. The circuit can be designed being four half adder.

iii. Differentiate between latches and flip flop. Draw and explain a master slave J-K flip flop.

iv. Using K – map, obtain the minimal SOP expressions of the following and design output of K-Map by NAND gates.

$$F(A,B,C,D) = \sum m(0,1,3,5,7,10,11,14) + D(6,12,15)$$

v. What is magnitude comparator? Design and explain a two bit comparator using logic gates.

vi. Design and explain full subtractor using half subtractors.

vii. What are the distinctions between a ripple counter and a synchronous counter? Illustrate the design and functionality of a Mod-12 counter using J-K flip-flops.

Section – C (खण्ड–ग)

Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) What are excitation tables and characteristic tables in the context of flip-flops? Provide the excitation table and characteristic table for a flip-flop.

ii) What is an encoder and what are its types? Provide a logic diagram for a Decimal to BCD priority encoder.

iii) What are shift registers, and what are their various types? Design a counter circuit using S-R flip-flops to implement the sequence: 4-6-2-5-0-3-7-1-4-6-....

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Dr.ShakuntalaMisra National Rehabilitation University, Lucknow
Institute of Engineering and Technology
Department ofElectronics & Communication Engineering
Sessional Examination-1st(2023-24)

Course Name: B.Tech. (ECE) Semester: 3rd
Subject Name: Electronics Device Paper Code: TEC-301

Time - 1Hrs + 15 minutes per hour extra time for V.I. & examinees with writer. Max Marks-20

Instructions:

- The question paper consists of three sections namely A, B, and C. All sections are compulsory.
- Section A- Each question will carries 01mark. All questions are compulsory.
- Section B- Answer any **5 out of 6**in the given questions with maximum **fifty (50) words**. Each question will carries **2 marks**.
- Section C- Answer any **1 out of 2**in the given questions in maximum **onehundred fifty (150) words**. Each question will carries **5 marks**.

Section – A

Objective Questions

1. Answer all the following questions 5×1=05

I. **Which of the following is not a property of semiconductors used in electronic devices?**

(a)They don't emit light (b) They excite electrons
(c) They have high thermal conductivity (d) they have variable electrical conductivity

II. **What is the effect of temperature on the recombination rate of electrons in electronic circuits?**

(a) Recombination rate increases with increase in the temperature
(b) Recombination rate decreases with increase in the temperature
(c) Recombination rate is independent of temperature
(d)Recombination of electrons doesn't occur in semiconductors

III. **Which of the following is correct about semiconductors in electronic devices?**

(a) Elemental semiconductors have direct band gap
(b) Compound semiconductors have indirect band gap
(c) Extrinsic semiconductors are injected with impurities
(d) Doping is done in intrinsic semiconductors

IV. **Which of the following is not correct about a step-graded junction in electronic devices?**

(a)Diodes with step-graded junctions are slower than a normal diode
(b) They are designed with abrupt junction
(c)They are either p+– n or p – n+ junction
(d) Depletion layer penetrates more into the lightly doped region

V. **Which of the following is not correct about semiconductors in electronic devices**

(a) Electrons are present below Fermi level in a semiconductor
(b) Which of the following is not correct about semiconductors in electronic devices?
(c) Pentavalent atoms are used in an n-type extrinsic semiconductor
(d) Fermi level is independent of temperature and doping

Section – B

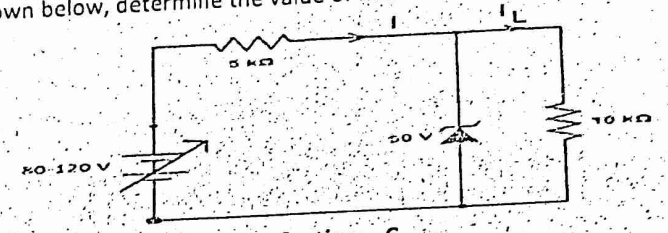
Short Answer Type Questions

2. Answer any five of the following questions in maximum 50 words. 5×2=10

I. Explain the conductor, insulator & semiconductor with example.
II. Expalin the action of P-N junction diode under forward & reverse bias,draw & explain the V-I charactreisitcs of P-N juction
III. Differentiate between zener breakdown and avalanche breakdown.
IV. Explain the P-type & N-type semiconductor.

V. Explain the depletion layer of PN junction diode.

VI. For the circuit shown below, determine the value of maximumand minimum zener diode current.



Section – C
(Descriptive Questions)

3. Answer *any one* question in maximum 150 words. 1×5=05

I. The reverse saturating current at room temperature is 0.3 μA. when a reverse bias is applied to a Ge diode .find the value of current flowing in the diode when 0.15V forward bias is applied at room.

II. Short notes on-.

a) Diffusion current

b) Drift current

c) Mobility of charge carrier

d) Thermal voltage

SEMESTER EXAMINATION DECEMBER-2023

Course Name: - B.Tech. (ECE) **Semester:- 3rd**

Paper Name: - Electronics Device **Paper Code:- TEC-301**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न तीन अंक का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में सात प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10** अंक का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न)

5x3 =15

1. Answer all the following questions.
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which of the following is not an electronic device?
   a) magnifying glass
   b) computer
   c) mobile
   d) keyboard

ii) Which of the following is not a property of semiconductors used in electronic devices?
   a) They excite electrons
   b) They don't emit light
   c) They have high thermal conductivity
   d) They have variable electrical conductivity

iii) Which of the following is correct about semiconductors in electronic devices?
   a) Elemental semiconductors have direct band gap
   b) Compound semiconductors have indirect band gap
   c) Extrinsic semiconductors are injected with impurities
   d) Doping is done in Intrinsic semiconductors

iv) Which of the following equation represents mass action law for semiconductors in electronic circuits?
   a) $n \times p = ni^{1/2}$
   b) $n \times p = ni^3$
   c) $n \times p = ni$
   d) $n \times p = ni^2$

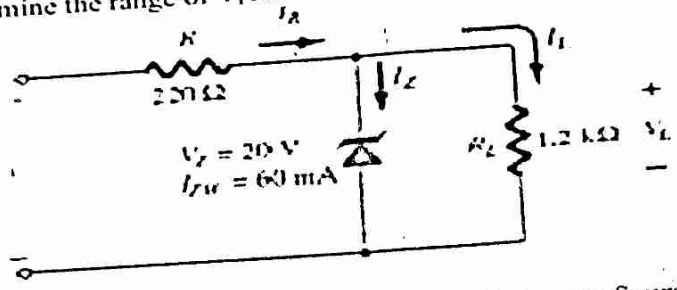
v) What type of semiconductor is used in LED electronic circuits?
   a) Compound semiconductor
   b) Intrinsic semiconductor
   c) Degenerated semiconductor
   d) Compensated semiconductor

Section – B (खण्ड–ब)
Short Answer Questions (लघूउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. 5x7=35
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Explain the action of P-N junction diode under forward & reverse bias, draw & explain the V-I characteristics of P-N junction

ii. Determine the range of V, for the fig. that will maintain the zener diode in " on " state?



iii. Discuss about the common-base, common-collector configurations of BJT with their input and output characteristics.

iv. Explain the operation of n-channel JFET with neat diagram. Also sketch its drain and transfer characteristics. Define pinch-off voltage.

v. Explain the Emers-Moll model & C-MOS transistor.

vi. A diode operating at 300K has forward voltage 0.4 V across it when the current through it is 10 mA and 0.42V when the current is twice as large. What value of I0 and η allow the diode to be modeled by the diode equation?

vii. Explain the P-type Semiconductor & N-type Semiconductor.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. 2x10=20
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) Explain the operation of n-channel depletion MOSFET with neat diagram. Also draw its drain and transfe characteristics.

ii) For a JFET given IDSS = 6 mA and VP = -4.5 V:
(a) Determine ID at VGS = -2V
(b) Determine VGS at ID = 3mA

iii) Explain the working of the following:
(a) LED
(b) Solar cell

Roll No. | | | | | | | | | | |

IET, Dr. Shakuntala Misra National Rehabilitation University, Lucknow,
Department of of Electronics and Communication Engineering
Sessional Test – 1

Sem. & Year: 3rd & 2nd | Session: 2023-24
Subject: Data Structure & Algorithm | Code: TEC-302
Duration: 90 Minutes | Max. Marks: 20

Part A

Attempt all questions (1×5=5 Marks)

1. A data structure, in which a element is added and removed Only from one end is known as:-
   (a) Queue (b) Stack
   (c) Array (d) None of these
2. Structure data type made up of finite collection of ordered elements, all of which are of the same data type is-
   (a) Record (b) Array
   (c) File (d) None of these
3. A data structure, defined at logical level is called _____ data type.
   (a) Abstract (b) Data type
   (C) Index (c) Front end
4. Generally stack data structure is represented through arrays but can also be possible through _____
   (a) Index (b) Stack
   (c) Binary (d) Linked
5. Long double have range from …… to…….and ……bytes.

Part B

Attempt any Five Questions (2×5=10 Marks)

1. What is data Structure? Classify and describe its type?

2. Differentiate between abstract data type and primitive data structures and compare stack with queues?

3. Try to represent the linked list and stack data structure using "struct" 'data structure? Write down advantages of linked list Implementation over arrays?

4. Define algorithm and write characteristics of algorithm? Write down an algorithm and flow chart to convert decimal base to binary base?

5. What is Graph in Data structure describes with figure and its classification? Differentiates between linear and non linear data structure?

6. Write down operations on data structures? Make a table of typical range and size of basic data types?

Part C

Attempt any one Questions **(5×1=5 Marks)**

1. Write down properties of an algorithm? Describe sequence, selection, iteration? Write a program of print the sum or difference of two arrays?
2. Write down about time and space complexity and define complexity of algorithm with respect to 3-cases? Write a program of print the sum or difference of two matrices?

SEMESTER EXAMINATION DECEMBER-2023

Course Name: - B.Tech. (ECE) **Semester:- III**

Paper Name: - Data Structure & Algorithm **Paper Code:- TES 302**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं राइटर लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

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- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
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Section – A (खण्ड–अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which of the following data structures is not linear?

a) Array
b) Linked List
c) Stack
d) Tree

ii) If the input sequence is 1,2,3,4,5 then identify the wrong stack permutation

a) 2,4,3,5,1
b) 3,5,4,2,1
c) 4,3,5,2,1
d) 5,4,3,1,2

iii) Consider the following recursive function fun (x,y). What is the value of fun(4,3)

```
Inf fun(int x, int y)
{
    If(x==1)
        return y;
    return fun(x-1, x+y);
}
```

a) 13
b) 12
c) 11
d) 10

iv) The maximum and minimum number of nodes in a binary tree of height 4 are
   a) 32 and 4 respectively
   b) 16 and 4 respectively
   c) 31 and 5 respectively
   d) 15 and 5 respectively

v) While inserting the elements 71, 65, 62, 69, 84, 83, 56, 82,92 in an empty binary search tree (BST) in the sequence shown, the elements in the lowest level are.....
   a) 56, 82
   b) 56, 83
   c) 82, 92
   d) 56, 92

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. 5x7=35
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Define data structure and explain the significance of studying data structure and algorithms

ii. What is a linked list? Discuss its advantages and disadvantages.

iii. Explain the concept of recursion and Iteration. Write a program for factorial any number by recursion in C language.

iv. Explain arrays and how to initialize a 2D array in C language. Write a C program for adding two 3x3 matrices.

v. What is a stack data structure, and how are its operations defined? Provide pseudocode for various stack operations.

vi. How many notations are used in stack data structures? Convert the given expression into prefix and postfix notations:

A + B * C / D ^ E ^ F * G – H + I

vii. What is an AVL tree? Consider an empty AVL tree and insert the following nodes in sequence: 21, 36, 45, 20, 8, 23, 40, 4, 2, 90, 52, 7

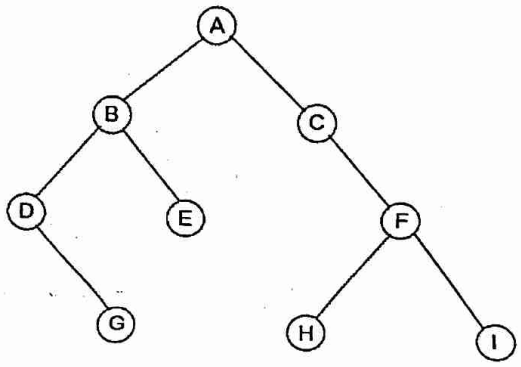
Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. 2x10=20
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) Explain the concept of a binary search tree (BST) and discuss its advantages and disadvantages compared to other types of trees.

ii) Define the concept of a tree data structure and elaborate on its components.

iii) Explain the concept of traversing a binary tree and outline all traversal methods for the given tree.



SEMESTER EXAMINATION, DECEMBER -2023

Course Name: -B. Tech.(E.C.E.) **Semester: -3rd**

Paper Name: -Network Theory **Paper Code: -TEC-305**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. Max Marks-70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries03 marks. All questions are compulsory.
- Section B- Answer any **5 out of 7** given questions in maximum hundred **(150) words**. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions in maximum five hundred **(300) words**. Each question carries **10 marks**.

Section – A

Objective Questions **3×5=15**

1. Answer all the following questions.

1. What is the purpose of network analysis?

   a) To design new networks

   b) To analyze the behaviour of electrical circuits

   c) To troubleshoot network issues

   d) All of the above

2. Which theorem states that any linear electrical network with voltage and current sources can be replaced by a single voltage source in series with a single resistor?

   a) Norton's Theorem

   b) Thevenin's Theorem

   c) Superposition Theorem

   d) Maximum Power Transfer Theorem

3. What is the Laplace transform used for in network analysis?

   a) To analyze sinusoidal steady-state response b) To convert time-domain equations into the frequency domain

   c) To calculate transient response in electrical circuits d) To determine the input-output relationship of a Network

4. Which theorem states that the maximum power is transferred from a source to a load when the resistance of the load is equal to the internal resistance of the source?

   a) Norton's Theorem

   b) Thevenin's Theorem

   c) Superposition Theorem

   d) Maximum Power Transfer Theorem

5. Which theorem states that the voltage across any branch in a network is equal to the product of the current through that branch and the impedance of the branch?

   a) Norton's Theorem

   b) Thevenin's Theorem

   c) Ohm's Law

   d) Tellegen's Theorem

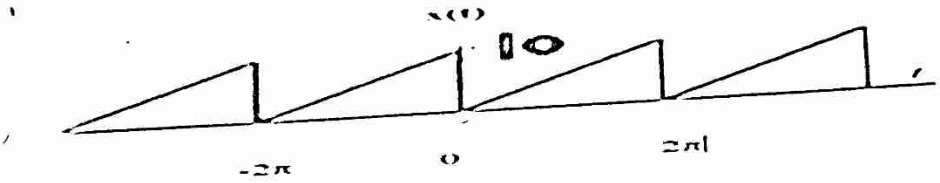
Section – B

Short Answer Questions

2. Answer any five of the following questions in maximum 150 words. 5×7=35

1. A complex wave have in an r. m. s. value of 200V has 15 percent third harmonics and 8 percent fifth harmonic. Find the r. m. s. value of fundamental and other harmonics.

2. Find the Trigonometric Fourier series for the waveform

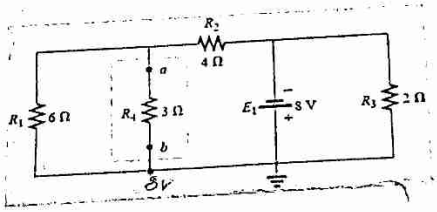


3. Plot the poles & zero graph following the transfer function

$$T(S) = S^2+4S+3/S^3+5S^2+4S$$

4. Describe the Low pass filter, high pass filter, band pass filter & band rejected filters.

5. Find the Thévenin equivalent circuit for the network in the R4 resistor of the network in shown below Figure.



6. Describe Kirchhoff's Current Law and Kirchhoff's Voltage Law. Explain their significance in analyzing electrical circuits, and provide an example illustrating their application in solving circuit problems.

7. Describe Maximum Power Transfer Theorem in electrical circuits. Explain the conditions under which maximum power transfer occurs in a circuit, and discuss its practical implications in circuit design.

Section – C
Descriptive Questions

3. Answer any two of the following question in maximum 300 words. **2×10=20**

1. Discuss Superposition Theorem in electrical network analysis. Explain the principle behind it, describe how it is applied to solve circuits with multiple sources, and provide an example demonstrating its application.

2. Find out the driving immittance condition fowling function –

   a) $Z(s)= 4S^2+S^2-3S+1/S^3+2S^2+2S+40$

   b) $Y(S)=15(S^3+2S^2+3S+4)/S^4+3S^3+6S^2$

3. Explain Norton's Theorem and Thevenin's Theorem. Discuss the conditions under which each theorem can be applied and compare their practical applications in simplifying complex circuits.

IET, Dr. ShakuntalaMisra National Rehabilitation University, Lucknow,
Department of
Sessional Test – 1

Sem& Year: III(2ND year) Session: 2023-24
Subject: Signals and Systems Code: TEC303
Duration: 90 Minutes Max. Marks: 20

Part A

Attempt all questions (1×5=5 Marks)

1. Unit step function u(t) value at t=0
a) 2 b) 1/2
c) 3 d) -1

2. Function u(n) –u(n-1) defined as
a) δ (n) b) r(n)
c) u(n) d) none of these

3. $\int_{-2}^{1}(t + t^2)\delta(t-3)dt$ value equal to
a) 1 b) 2
c) 3 d) 0

4. Fundamental time period of signal $e^{j7\pi n}$
a) 3 b) 2
c) 8 d) 7

5. $x(t)^* \delta(t+t_0)$ equal to
e) $x(t)$ f) $\delta(t+t_0)$
g) $x(t+t_0)$ h) $\delta(t)$

Part B

Attempt any Five Questions **(2×5=10 Marks)**

1. Determine energy and power value of signal $x(t) = e^{-2t}\,u(t)$
2. Determine even and odd part of signal $x(t) = e^{-2t}\,Cos(t)$
3. Draw the waveform of signal a) $u(t-2)$ b) $u(-2t+1)$
4. Determine fundamental time period a) $x(t) = je^{j10t}$
   b) $x(t) = e^{(-1+j)t}$
5. Determine and sketch the convolution of two signal
   $x(t) = -1 \quad -1 \le t \le 1$ and $h(t) = \delta(t+1) + 2\delta(t+2)$
6. Define causal, anti-causal and non-causal signal

Part C

Attempt any one Questions **(5×1=5 Marks)**

1. Each system determines whether it is memoryless, causal, linear, stable, and time invariant.
   (a) $y(n) = nx(n)$ (b) $y(t) = x^2(t)$

2. Find the convolution output
   $x(t) = u(t-3) - u(t-5)$

   $h(t) = e^{-3t}\,u(t)$

SEMESTER EXAMINATION DECEMBER-2023

Course Name: - B.Tech(EC) **Semester:-III**

Paper Name: - Signals and Systems **Paper Code:- TEC 303**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं राइटर लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न तीन अंक का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में सात प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10** अंक का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न) 5x3 =15

1. Answer all the following questions.
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Continuous time unit step function u(5) equal to
   a) Finite
   b) Zero
   c) One
   d) Infinite

ii) Determine the energy of $x(n) = (1/2)^n u(n)$
   a) 1
   b) 0
   c) 4/3
   d) 3/4

iii) The Z-transform of $\delta[n]$ is
   a) 0
   b) 1
   c) Z
   d) None of these

iv) System $x(t) * \delta(t-t_0)$ equal to (*) is show convolution
   a) $x(t)$
   b) $\delta(t-t_0)$
   c) $x(t-t_0)$
   d) 1

v) Laplace transform of ramp function equal to
   a) 1
   b) $\frac{1}{s}$
   c) $\frac{1}{s^2}$
   d) None of these

Section – B (खण्ड–ब)
Short Answer Questions (लघूत्तरीय प्रश्न)

5x7=35

2. Answer any five of the following questions in maximum 150 words.
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Determine energy and power of following signals.

(a) $x(t) = e^{-2t}\,u(t)$ (b) $x(t) = e^{\,j(2t+\pi/4)}$ (c) $x(t) = u(t)$

ii. For each system determine whether it is (i) memory less (ii) stable (iii) causal (iv) Linear (v) time-invariant

(a) $y(n)=x(n^2)$ (b) $y(t)=x(2t)$

iii. Determine and sketch the convolution of two signal

$x(t) = 1 \quad -1\le t\le 1 \quad h(t) = \delta(t+1) + 2\delta(t+2)$

iv. Determine the Z Transform and ROC

(a) $x(n) = (1/3)^n u(n)$ (b) $x(n) = (1/2)^n u(-n-1)$

v. *Find the inverse Laplace transform*

$$X(s) = \frac{-3}{(s+2)(s-1)}$$

If the ROC is (a) $R\{s\} > 1$ (b) $R\{s\} < -2$ (c) $-2 < R\{s\} < 1$

vi. Find the Fourier transform of signal

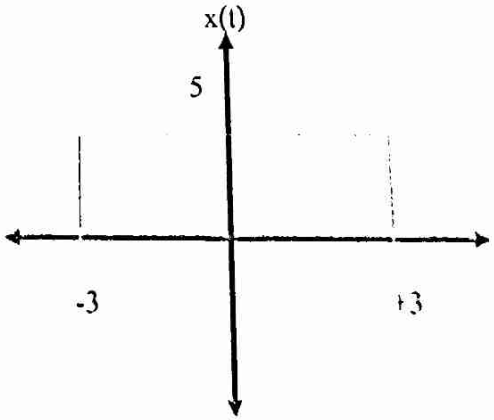
$x(t) = e^{-a|t|}$

vii. Define and describe sampling theorem and sampling process.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. 2x10=20
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) For the signal x(t) sketch



(a) x(3t) (b) x(t/6) (c) x(3t+2) (d) x(-t) (e) x(-2t-1) (f) x(-1/3t+1)

ii) Solve the second order linear differential equation

$$d^2y(t)/dt^2 + 5dy(t)/dt + 6y(t) = dx(t)/dt + x(t)$$

For Initial Condition $y(0-)=2$, $y'(0-)= 1$ and input $x(t) = e^{-4t}u(t)$

iii) Find the convolution output $x(t) = u(t-3) - u(t-5)$ $\quad h(t) = e^{-3t}u(t)$